



# CRLDP & OUNI Module Description

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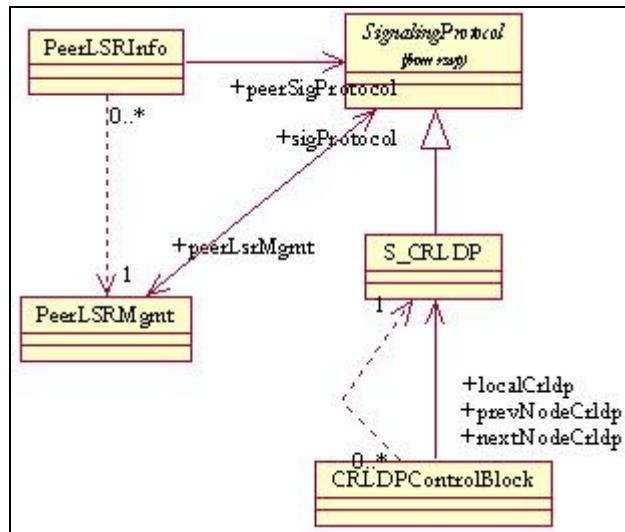
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## 1. CRLDP Module

In GLASS, we support two signaling protocols, RSVP-TE and CRLDP. The CRLDP module consists of four sub-modules. sCRLDP, CRLDPControlBlock, peerLSRMgmt and peerLSRInfo module.

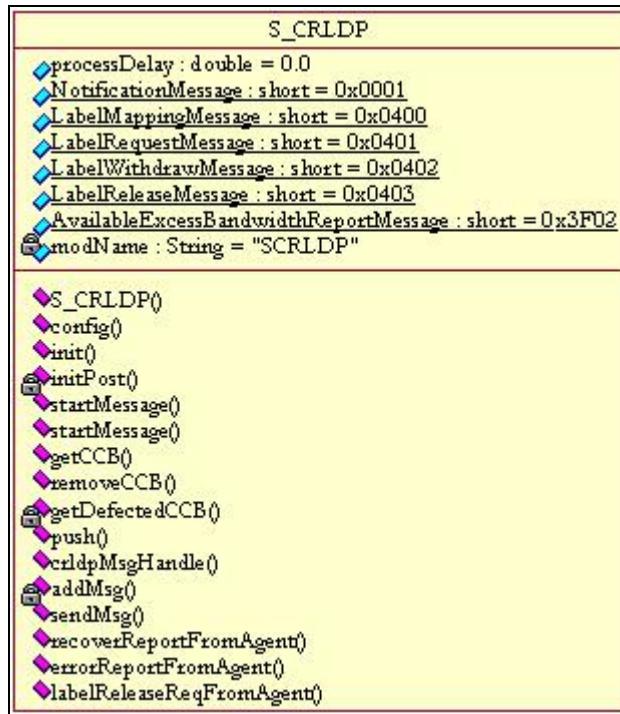
We assume that the signaling message is not delivered through the data channel but logical control channel. In order to emulate the logical control channel we must know peer LSR module information to deliver signaling information and messages. Peer node information is maintained by PeerLSRMgmt module. After IP module finishes the initialization phase, MPLSMgmt module triggers the configuration of peer LSR. Peer node's information is maintained by the Peer LSRInfo module. Figure 1 shows the relationship among these modules.



**Figure 1 Relationship among the CR-LDP modules**

### 1.1 sCRLDP module

sCRLDP module plays a key role in CR-LDP signaling modules. It is inherited from “SignalingProtocol” abstract class and has the method to deliver signaling messages, create control block and error reporting. It creates the CRLDPControlBlock when it receives the label request message and manages these objects. Each LSP has one control block and all information is stored in it. To maintain the created CCBs this module uses hash table with LSP ID as key value. Figure 2 shows the class diagram of sCRLDP module.

**Figure 2 sCRLDP module**

CRLDPControlBlock module has the whole information of LSP. It has the methods to check the network resource, label mapping, send error message, and so on.

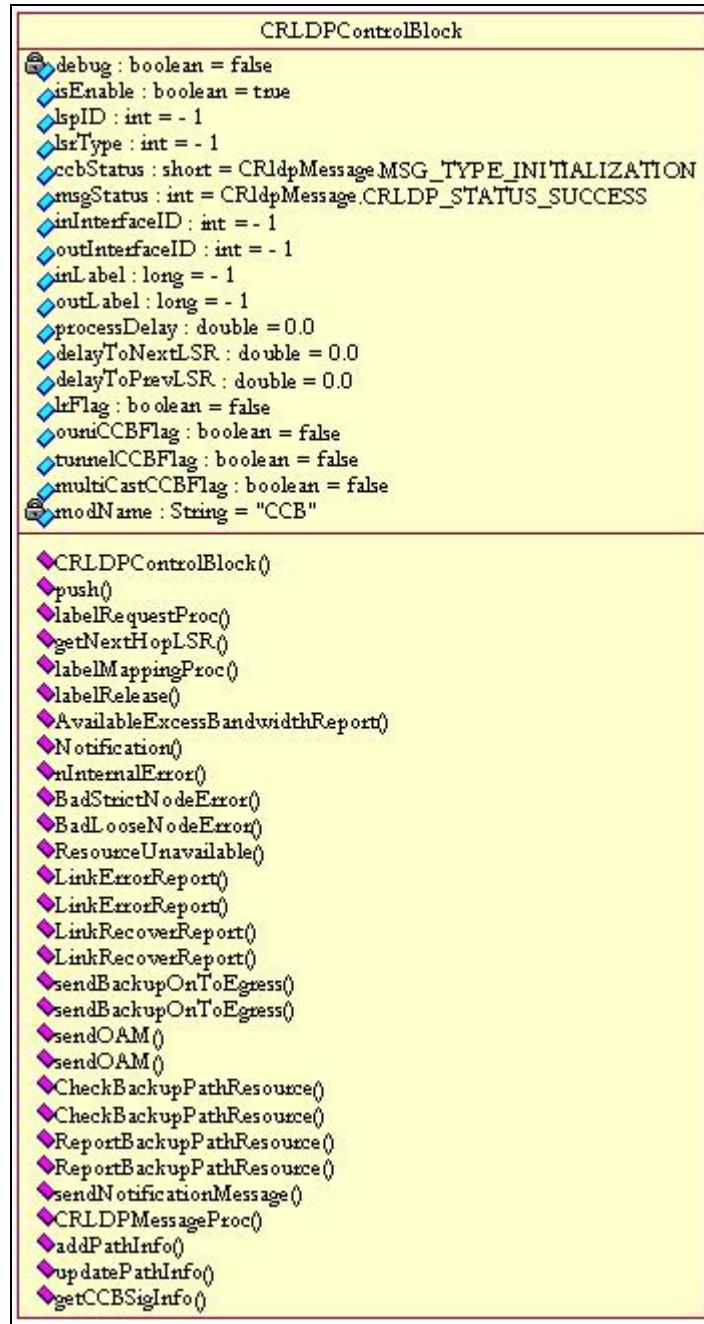


Figure 3 CRLDPControlBlock Class Diagram

## 1.2 Peer LSR information management

As mentioned above, signaling protocol maintains the information related to peer LSR for delivering signaling messages. After initialization, peer LSR management module creates the peer information according to the attached interface type. Peer LSR information is stored in Peer LSR Info class. It has the peer interface information, identification information, and signaling information.

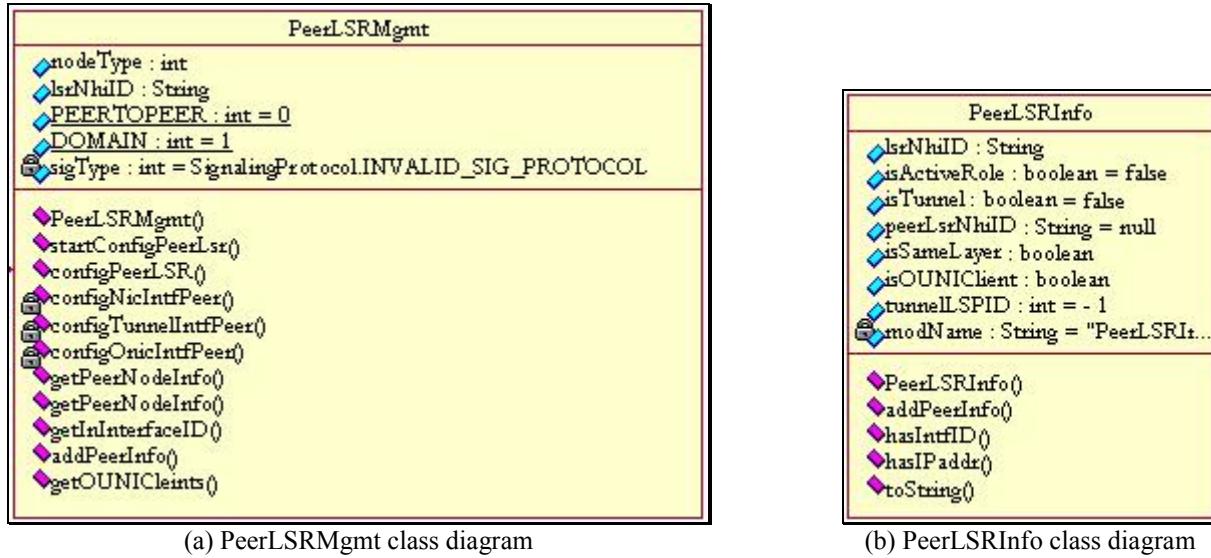


Figure 4 Peer Information

## 2. LSP Configuration Information

LSP configuration information is read from the DML file and stored in LSPSetupParams class. To cooperate with two signaling protocols we model interface module that read the LSP configuration and create the proper information dependent to the signaling protocol. In CRLDP module, LSPSetupParams is converted into several objects through the interface module, SigInfoInterface class. The converted information is CRldpSigInfo class as shown in Figure 5

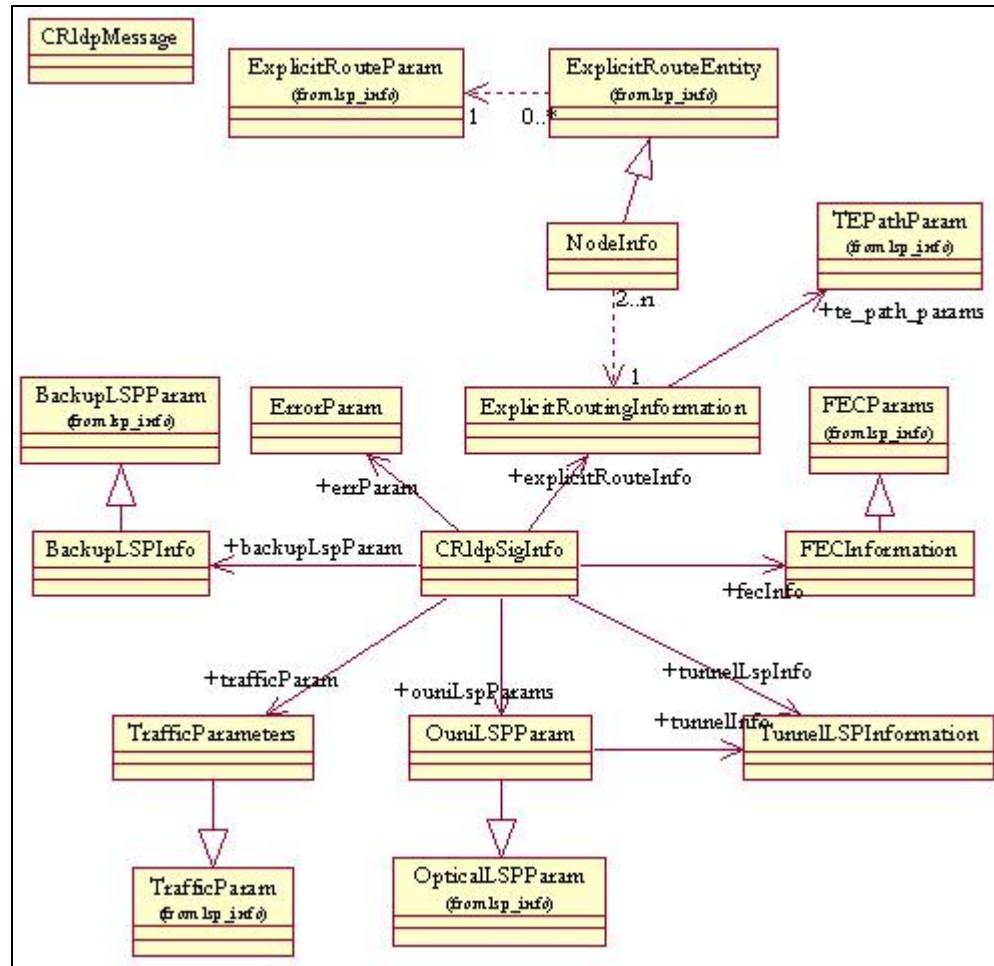


Figure 5 CRLDP Message Objects Relationship

CRLDP message is modeled CRldpMessage and CRldpSigInfo class.

### 3. OUNI Module

OUNI module consists of three modules: OUNI\_N, OUNI\_C, and OUNIConnection. OUNI\_N and OUNI\_C is inherited from OUNIModule and play a server and client role respectively. OUNI\_N module is installed at the edge node of Optical Network such as edge OXC and OUNI\_C is installed at the edge node of MPLS network.

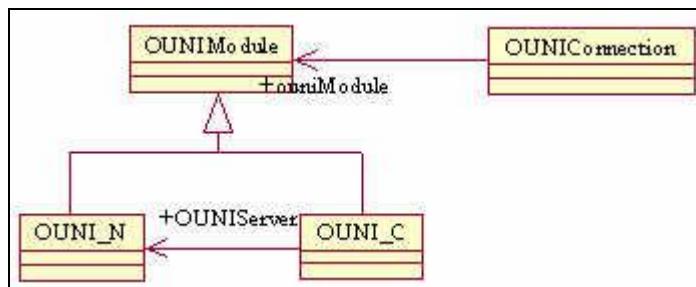
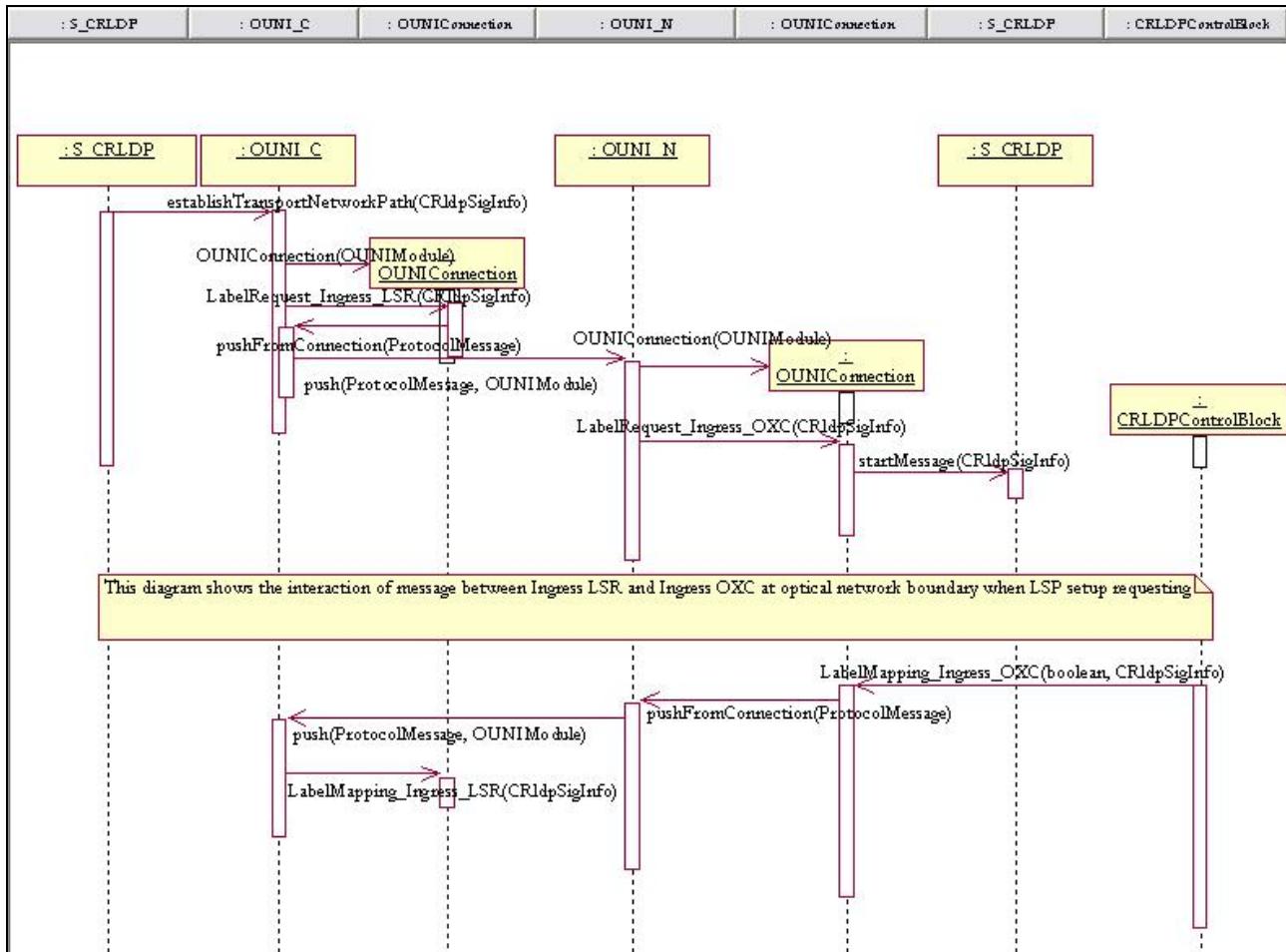


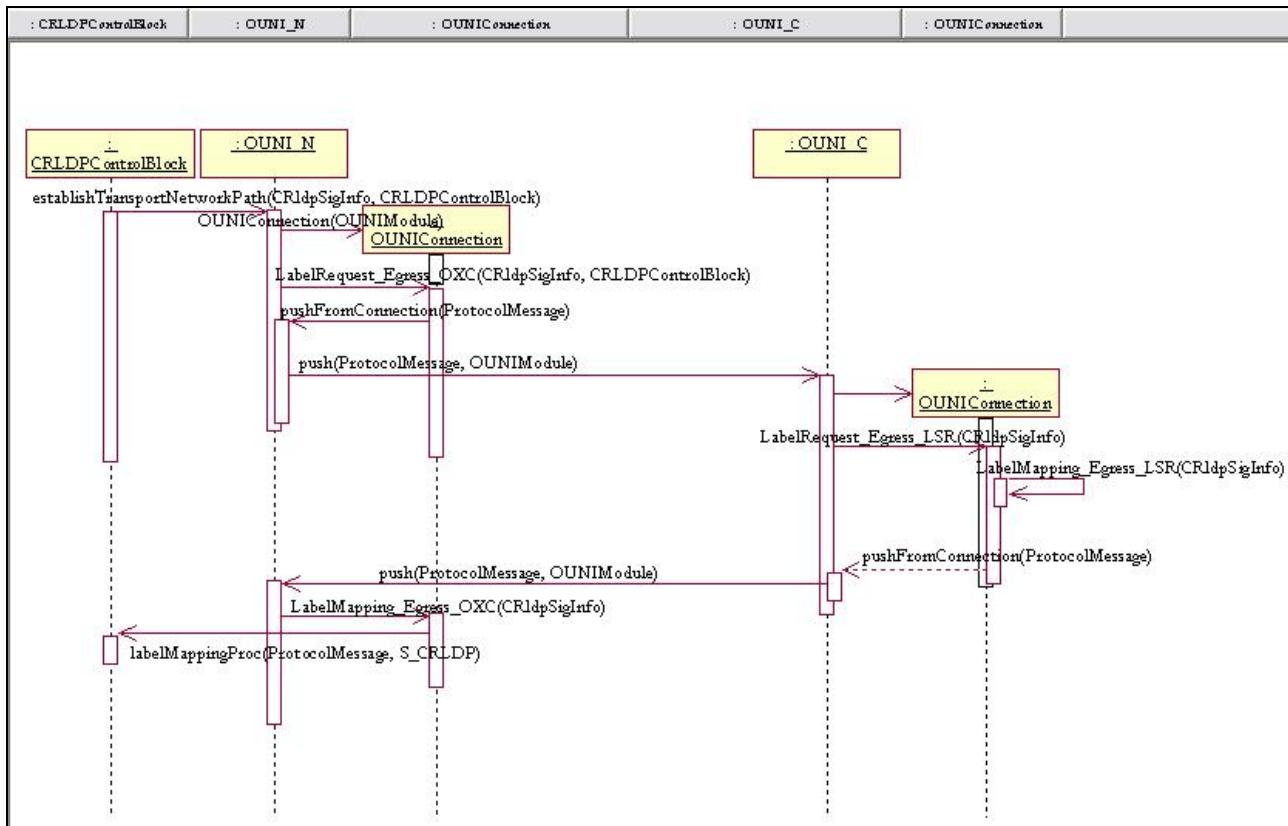
Figure 6 Relationship OUNI modules

Figure 6 shows the overall structure of OUNI modules. OUNI\_N and OUNI\_C are inherited from the OUNIModule. OUNI\_C module has a OUNI\_N as member function to verify the OUNI Server module that is corresponding to client module.



**Figure 7 Sequence Diagram of Label Request and Mapping at Ingress LSR**

Figure 7 shows the sequence diagram between the Ingress LSR and Ingress OXC. When the signaling protocol is requested to setup optical LSP it calls the OUNI\_C module's function. When the OUNI\_C receives the connection request it creates OUNIConnection instance and delivers the requested information to the OUNI\_N. When OUNI\_N receives the request it also create OUNIConnection instance to maintain the requested information and call signaling protocol to trigger the setup in optical network. When the ingress OXC receives the label binding request from the previous OXC it call the OUNIConnection instance and then the connection instance delivers it to the OUNI\_C module.



**Figure 8 Sequence Diagram of Label Request and Mapping at Egress LSR**

Figure 8 shows the sequence diagram between the egress OXC and egress LSR. When the egress OXC receives the LSP setup request it call the OUNI\_N module to create the OUNIConnection instance. The created connection instance call the function of OUNI\_C located in the egress LSR. The OUNI\_C instance in the egress LSR creates the OUNIConnection instance and delivers the received information to it. After the OUNIConnection instance performs the LSP binding procedure, it request the binding procedure of the egress OXC calling the OUNI\_N function.

### 3.1 OUNI\_C Module

OUNI\_C module performs the client role of OUNI. Each LSR connected to OXC configures the OUNI\_C module to do OUNI client role. When the optical LSP is established, MPLS edge router(LSR) requests the Optical connection establish request to the OUNI\_C module. Then OUNI client module creates the OUNIConnection that represents the OUNI connection and handles the procedures required establishing the optical LSP.

### 3.2 OUNI\_N Module

OUNI\_N module plays a server role of OUNI. If the node type is OXC, OUNI\_N module is created and receives the LSP request information from the OUNIConnection module that is created by the OUNI\_C module. When it receives LSP establishment/release request from the OUNI\_C module, it also creates the OUNIConnection module to maintain the connection information.

### **3.3 OUNIConnection Module**

OUNIConnection module performs the key role among OUNI modules. It represents the Optical LSP between edge MPLS router and OXC. It establishes the connection between OUNI client and server and delivers the request to the opposite side.